(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
11 January 2001 (11.01.2001)

PCT

(10) International Publication Number
WO 01/01909 A1

(51) International Patent Classification[7]: A61F 13/20

(21) International Application Number: PCT/US00/13812

(22) International Filing Date: 19 May 2000 (19.05.2000)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
09/343,760 30 June 1999 (30.06.1999) US

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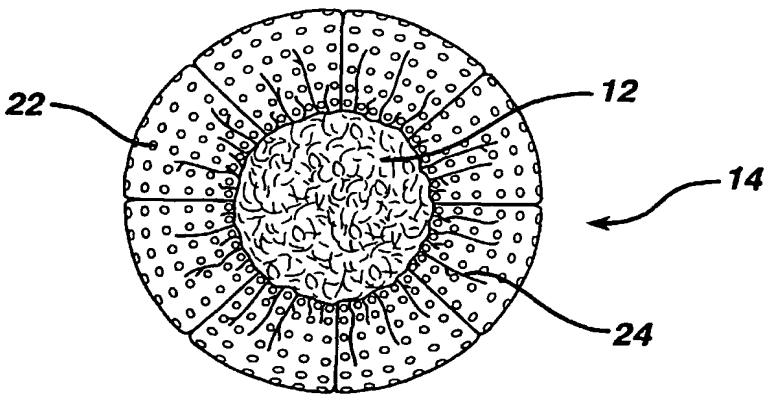
(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:
— *With international search report.*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: DOMED TAMPON WITH SURFACTANT-TREATED COVER



(57) Abstract: A process for forming tampons having an absorbent structure (12) substantially enclosed by an apertured film cover (22) that has a nonionic surfactant at least partially applied to the cover (22)is disclosed. An absorbent structure (12) is formed into a tampon blank wherein an individual sheet substantially encloses the tampon blank, forming a cover (22). The covered tampon blank is compressed in a press to form a substantially cylindrical, compressed tampon (10) having a cover (22) comprising the individual sheet. The compressed tampon (10) is transferred to a further press, and at least a portion of the tampon (10) covered by the coated sheet portion of the cover (22) is further compressed to form a constricted portion having overlapping portions of the cover (22) being folded upon each other in a substantially unbonded manner. Preferably, the constricted portion is a dome-shaped introduction end (14) of the tampon.

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Domed Tampon with Surfactant-Treated Cover

Cross Reference to Related Applications

This invention is related to the following copending applications: US Ser. No. 09/343,759, filed June 30, 1999, entitled "Continuous Method of Providing Individual Sheets from a Continuous Web" (Attorney Docket, PPC-668); US Ser. No. 09/345,090, filed June 30, 1999, entitled "Multilayered Apertured Film Wrapping Element for Absorbent Articles" (Attorney Docket, PPC-691); US Ser. No. 09/345,089, filed June 30, 1999, entitled "Heterogeneous Apertured Film Wrapping Element for Absorbent Articles" (Attorney Docket, PPC-713); US Ser. No. 09/345,088, filed June 30, 1999, entitled "Tampon with Cover and Nonionic Surfactant" (Attorney Docket, PPC-708); US Ser. No. 60/141,688, filed June 30, 1999, entitled "Sealing Roller and Sealing Roller Element, Particularly for Producing a Tampon for Feminine Hygiene and Method Therefore" (Attorney Docket, J&J-1819); and US Ser. No. 60/141,690, filed June 30, 1999, entitled "Tampon for Feminine Hygiene and Process and Apparatus for its Production" (Attorney Docket, J&J-1820).

Background of the Invention

The present invention relates to a tampon comprising an absorbent body, having an introduction end and a withdrawal end, and a longitudinal main portion therebetween. The tampon further having a constriction at an end thereof. The tampon is substantially enclosed within a cover comprising fluid impervious plastic material in the form of a resilient three-dimensional web having a multiplicity of perforations said web comprises a nonionic surfactant on its outer surface, at least in the

a portion corresponding to the constricted portion of the tampon.

There are several types of covers that have been or are currently in use for tampons: woven fabrics, nonwoven fabrics, apertured films, reticulated films, polymer nets, and the like. Several of the proposed tampon covers have incorporated features that have made them effective in heat sealing operations to attach them to the absorbent structure of the tampon and/or to other portions of the covers themselves. However, due to the nature of the heat-sealable covers, processes subsequent to the attachment of the cover to the absorbent structure can result in undesired additional sealing of the covers. Therefore, the covers have tended not to extend into regions that are further manipulated, such as subsequent dome-forming steps.

An example of a tampon cover that is heat-sealable, but that does not extend substantially into a dome-shaped introduction end is described in Friese, US Pat. Nos. 4,816,100; 4,836,450; and 4,859,273. Another example is sold as the o.b.® line of tampons, available in applicator and digital form from Personal Products Company of Skillman, New Jersey.

Therefore, what is needed is a tampon having an apertured film cover and being capable of expanding to a substantially cylindrical body without significant constriction at any restricted portion, especially, the outer introduction end and providing a reduction of frictional forces during introducing or withdrawal of the tampon from the body cavity and is processable in a commercially efficient manner.

Summary of the invention

The present invention relates to a process for forming tampons having an absorbent structure substantially enclosed by an apertured film cover that has a nonionic surfactant at least partially applied to the cover. The process includes coating at least a portion of a web of fluid-impervious plastic material with a nonionic surfactant to form a coated web portion having a coating weight of less than about 0.5 grams/meter^2 ("gsm"). An individual sheet comprising a coated sheet portion is separated from the web and attached to an absorbent structure. The absorbent structure is formed into a tampon blank wherein the individual sheet substantially encloses the tampon blank, forming a cover. The covered tampon blank is compressed in a press to form a substantially cylindrical, compressed tampon having a cover comprising the individual sheet. The compressed tampon is transferred to a further press, and at least a portion of the tampon covered by the coated sheet portion of the cover is further compressed to form a constricted portion having overlapping portions of the cover being folded upon each other in a substantially unbonded manner. Preferably, the constricted portion is a dome-shaped introduction end of the tampon.

The invention also relates to a tampon having a nonionic surfactant coated portion of its cover extending into a constricted portion having overlapping portions of the cover being folded upon each other in a substantially unbonded manner. Preferably, the constricted portion is a dome-shaped introduction end of the tampon.

Brief Description of the Drawing

Fig. 1 is a perspective view of a compressed tampon having a nonionic surfactant-coated cover.

Fig. 2 is a perspective view of a compressed tampon of the present invention having a nonionic surfactant-coated cover extending substantially into a dome-shaped introduction end.

Fig. 3 is an enlarged plan view of the introduction end of the tampon of Fig. 2.

Detailed Description of the Preferred Embodiment

The present invention relates to a tampon 10 comprising an absorbent body 12, having an introduction end 14 and a withdrawal end 16, and a longitudinal main portion 18 therebetween. The tampon further has a constriction 20 at an end thereof. The tampon is substantially enclosed within a cover 22 comprising fluid impervious plastic material in the form of a resilient three-dimensional web having a multiplicity of perforations, said web comprises a nonionic surfactant on its outer surface, at least in a portion corresponding to the constricted portion of the tampon.

Special advantages are provided by a web of a fluid-impervious plastic material comprising a blend of at least two thermoplastic polymeric components, a continuous surface of a first thermoplastic polymeric component that exhibits a first melting point temperature and a dispersed surface of an immiscible second polymeric component that exhibits a second melting point temperature, lower than the first melting point temperature. When such a web is heated to a temperature between the first melting point temperature and the second melting point temperature, the second thermoplastic polymeric component is capable of forming an adhesive bond between said plastic material and the absorbent body and between said first and second surfaces of the web. These webs are described in more

detail in US Ser. No. 09/345,090, filed June 30, 1999, entitled "Multilayered Apertured Film Wrapping Element for Absorbent Articles" (Attorney Docket, PPC-691), and US Ser. No. 09/345,089, filed June 30, 1999, entitled "Heterogeneous Apertured Film Wrapping Element for Absorbent Articles" (Attorney Docket, PPC-713).

Accordingly, the circumferential surface of the absorbent body is completely covered and enclosed by said web preventing a loss of fibers and facilitating the introduction and withdrawal of the tampon into and out of the body cavity. In addition, the processing of the tampon is improved by the nonionic surfactant.

According to a further feature of the tampon according to the invention, the web has first and second surfaces, the first surface exhibiting said multiplicity of apertures therein, each of the fiber-like elements exhibiting a cross-section comprising a base portion in the plane of the first surface and a sidewall portion joined to each edge of the base portion, the sidewall portions extending generally in the direction of the second surface of the web, the intersecting sidewall portions being interconnected to one another intermediate the first and second surfaces of the web, the interconnected sidewall portions terminating substantially concurrently with one another in the plane of the second surface. The sidewall portions joined to each edge of the base portion and extending generally in the direction of the second surface of the web improve a mechanical interaction between said sidewall portion and the fiber material of the absorbent body, so that the cover is securely positioned at the outer surface of the absorbent body in its non-expanded condition and, particularly, also in its expanded position.

The nonionic surfactant is preferably an ethoxylate. In one embodiment of the inventive tampon said ethoxylate is an ethoxylated fatty acid polyolester. In a preferred embodiment said ethoxylate is an ethoxylated fatty acid sorbitan ester. A representative, non-limiting list of useful sorbitan esters includes polyoxyethylene sorbitan laurate (also known as Polysorbate 20 and 21), polyoxyethylene sorbitan palmitate (also known as Polysorbate 40), polyoxyethylene sorbitan stearate (also known as Polysorbate 60 and 61), polyoxyethylene sorbitan tristearate (also known as Polysorbate 65), polyoxyethylene sorbitan oleate (also known as Polysorbate 80 and 81), and polyoxyethylene sorbitan trioleate (also known as Polysorbate 85). Among the aforementioned ethoxylated fatty acid sorbitan esters, polyoxyethylene-20-sorbitan monolaurate is most preferred.

In an alternative embodiment of the inventive tampon, the ethoxylate is a polyoxyethylene alkyl ether. A representative, non-limiting list of useful polyoxyethylene alkyl ethers includes polyoxyethylene lauryl ether, polyoxyethylene stearyl ether (also known as Steareth-2, Steareth-10, and the like), polyoxyethylene cetyl ether (also known as Ceteth-2, Ceteth-10, and the like), and polyoxyethylene oleyl ether (also known as Oleth-2, oleth-10, and the like). Among the aforementioned polyoxyethylene alkyl ethers, polyoxyethylene stearyl ether is most preferred.

In a third alternative embodiment the ethoxylate is an ether of an olefinic diol. A representative, non-limiting list of such olefinic diols useful in the present invention includes the following: polyethylene glycol, polypropylene glycol, polybutylene glycol, propylene glycol, and the like. The olefinic diols are preferably

liquid at a temperature of less than about 35° C. This weight is typically dictated by their molecular weight. As used herein in the specification and claims, the term "molecular weight" refers to the number average molecular weight of a compound. Preferably, the olefinic diol is polyethylene glycol, having a molecular weight of less than about 600, or polypropylene glycol, having a molecular weight of less than about 4,000. Most preferably, olefinic diol is polyethylene glycol, having an average molecular weight of less than about 600.

It is to be understood that the nonionic surfactants used in the tampon and in its manufacture as described herein may be commercially available. Examples thereof are marketed under the registered trademarks "TWEEN" and "BRIJ" of ICI, Atlas Chemical Division, Wilmington, DE, USA.

Preferably, the nonionic surfactant is applied to the web at coating weights up to about 0.5 grams/meter^2 ("gsm"). More preferably, the coating weight is about 0.1 to about 0.4 gsm, and most preferably, it is applied at a coating weight of about 0.16 to about 0.36 gsm.

The hydrophilic nonionic surfactant is applied to the cover at least on a portion of the tampon that is further compressed to form a constricted portion having overlapping portions of the cover folded upon each other in a substantially unbonded manner. Preferably, the constricted portion is a dome-shaped introduction end of the tampon, and therefore, in a preferred embodiment, the coated portion of the cover of the tampon allows that overlapping portions of said cover are folded upon each other in a substantially unbonded manner on the introduction end and substantially prevents a bonding between the plastic web and the absorbent body. In

addition, the nonionic surfactant can reduce the frictional forces of the tampon while introducing or removing the tampon into or out of the body cavity and during processing of the tampon. Furthermore, the tampon provided with the nonionic surfactant provides an improved fluid transfer across the cover. In this connection a dome-shaped introduction end of the tampon is especially preferable.

In this connection, it has been realized that an ejection force coaxially directed to the longitudinal axis of the pressed tampon as to eject said tampon from the press may amount to less than about 1000 N. This is described in US Ser. No. 09/345,088, filed June 30, 1999, entitled "Tampon with Cover and Nonionic Surfactant" (Attorney Docket, PPC-708).

The absorbent structure may be any absorbent means that is capable of absorbing and/or retaining liquids (e.g., menses and/or urine). The absorbent structure can be manufactured in a wide variety of sizes and shapes and from a wide variety of liquid-absorbing materials. A representative, non-limiting list of useful materials includes cellulosic materials, such as rayon, cotton, wood pulp, creped cellulose wadding, tissue wraps and laminates, peat moss, and chemically stiffened, modified, or cross-linked cellulosic fibers; synthetic materials, such as polyester fibers, polyolefin fibers, absorbent foams, absorbent sponges, superabsorbent polymers, absorbent gelling materials; formed fibers, such as capillary channel fibers and multilimbed fibers; combinations of materials, such as synthetic fibers and wood pulp including coformed fibrous structures (e.g., those materials described in Anderson et al., U.S. Patent No. 4,100,324); or any equivalent material or combinations of materials, or mixtures of these.

Preferably, the absorbent structure comprises fibers. Preferably, the fibers are relatively stiff. One type of fibers that is particularly useful in the practice of the present invention is multilimbed fibers, such as those disclosed in EP 301 874 (the fibers form fabrics having relatively high flexural rigidity). These multilimbed fibers and other fibers having a sufficient stiffness may provide further benefits to the present invention, as they can contribute to expanding the constricted portion of the tampon due to their resiliency. This may overcome the constriction that may be a result of some minor, inconsequential bonds being formed between the cover and itself or other elements of the tampon.

As shown in Fig. 3, the cover 22 extends substantially into a constriction, such as a dome-shaped introduction end 14. This doming causes folds 24 and other deformations to occur in the cover 22 at the domed introduction end. In use, the introduction end 14 of the tampon 10 can expand completely as soon as it is engaged by body fluid. This characteristic can be enhanced by the fact that said cover having overlapping portions 24 at the introduction end 14 of the tampon 10 is substantially not bonded to the absorbent structure 12, so that the absorbent body with its cover 22 can freely expand if engaged by body fluid.

The invention also relates to a process for the manufacture of a tampon as disclosed above. The process includes coating at least a portion of a web of fluid-impervious plastic material with a nonionic surfactant to form a coated web portion having a coating weight of less than about 0.5 gsm. An individual sheet comprising a coated sheet portion is separated from the web and attached to an absorbent structure. It may be attached generally as disclosed in Friese, US Pat. No.

4,816,100, or as disclosed in US Ser. No. 60/141,688, filed June 30, 1999, entitled "Sealing Roller and Sealing Roller Element, Particularly for Producing a Tampon for Feminine Hygiene and Method Therefore" (Attorney Docket, J&J-1819). The absorbent structure is formed into a tampon blank wherein the individual sheet substantially encloses the tampon blank, forming a cover. The covered tampon blank is compressed in a press to form a substantially cylindrical, compressed tampon 10 having a cover 22 comprising the individual sheet. The compressed tampon 10 is transferred to a further press, and at least a portion of the tampon 10 substantially covered by the coated sheet portion of the cover 22 is further compressed to form a constricted portion having overlapping portions 24 of the cover 22 being folded upon each other in a substantially unbonded manner. Preferably, the constricted portion is a dome-shaped introduction end 14 of the tampon 10. The application of the nonionic surfactant is also sufficient to reduce the ejection force of the compressed tampon from the press to less than about 1000 N.

Surprisingly, it has been found that the forming of the constriction, such as a dome-shaped introduction end of the tampon, that is at least partially covered by the coated web, as one step during the process of manufacturing the tampon could be realized without negatively affecting the effectiveness of the tampon with regard to its absorption capacity and absorption velocity. This is because any undesired bonding of the cover material to itself or to the material of the absorbent body is substantially prevented.

In addition to the above mentioned advantages the production capacity could be enhanced by the fact that the hydrophilic nonionic surfactant applied less than about

0.5 gsm is sufficient for the realization of the present invention.

In addition, the immiscible blend of thermoplastic polymeric components having different melting point temperatures provides the advantage that the plastic material retains its structure when the lower melting point component is sealed to other portions of the cover and/or to other elements of the tampon in the formation of the tampon blank.

The disclosures of all US patents and patent applications, as well as any corresponding published foreign patent applications, mentioned throughout this patent application are hereby incorporated by reference herein.

The specification and embodiments above are presented to aid in the complete and non-limiting understanding of the invention disclosed herein. Since many variations and embodiments of the invention can be made without departing from its spirit and scope, the invention resides in the claims hereinafter appended.

WHAT WE CLAIM IS:

1. A process for manufacturing a tampon comprising the steps of:

a) at least partially coating a web of fluid-impervious plastic material with a nonionic surfactant to form a coated web portion, the web being in the form of a resilient three-dimensional web, the web having opposed first and second edges, and a substantially infinite length and having a multiplicity of apertures therein, the coated web portion having a coating weight of less than about 0.4 gsm;

b) separating an individual sheet comprising a coated sheet portion from the web;

c) attaching the individual sheet to an absorbent structure;

d) forming the absorbent structure into a tampon blank wherein the individual sheet substantially encloses the tampon blank;

e) compressing the tampon blank in a press to form a substantially cylindrical, compressed tampon having a cover comprising the individual sheet;

f) transferring said compressed tampon to a further press and

g) applying pressure to further compress at least a portion of the tampon covered by the coated sheet portion of the cover to form a constricted portion having overlapping portions of the cover being folded upon each other in a substantially unbonded manner.

2. The process of claim 1 wherein the constricted portion comprises a dome-shaped insertion end.

3. The process of claim 1 wherein the nonionic surfactant is applied at a coating weight of about 0.1 to about 0.4 gsm.

4. The process of claim 3 wherein the nonionic surfactant is applied at a coating weight of about 0.16 to about 0.36 gsm.

5. The process of claim 1 wherein the fluid-impervious plastic material comprises a blend of at least two thermoplastic polymeric components, a continuous phase of a first thermoplastic polymeric component that exhibits a first melting point temperature and a dispersed phase of an immiscible, second thermoplastic polymeric component that exhibits a second melting point temperature, less than the first melting point temperature, such that when the web is heated to a temperature between the first melting point temperature and the second melting point temperature, the second thermoplastic polymeric component is capable of forming an adhesive bond between said plastic material and the absorbent body and between said first and second surfaces of the web.

6. The process of claim 5 wherein the step of attaching the individual sheet comprises applying heat and pressure to thermally bond the sheet to the absorbent sliver.

7. The process of claim 1 wherein the hydrophilic nonionic surfactant is an ethoxylate selected from the group comprising ethoxylated fatty acid polyolesters, polyoxyethylene alkyl ethers and ethers of olefinic diols.

8. The process of claim 1 wherein said hydrophilic nonionic surfactant is applied to the web as a processing aid.

9. The process of claim 1 wherein the tampon is capable of expending to a substantially cylindrical body without significant constrictions at the further compressed portion of the tampon.

10. The process of claim 1 wherein the absorbent structure comprises fibers.

11. The process of claim 10 wherein the absorbent structure comprises stiff fibers.

12. The process of claim 10 wherein the absorbent structure comprises multilimbed fibers.

13. A process for manufacturing a tampon comprising the steps of:

a) at least partially coating a web of fluid-impervious plastic material with a hydrophilic nonionic surfactant, the web being in the form of a resilient three-dimensional web, the web having opposed first and second edges, and a substantially infinite length and having a multiplicity of apertures therein;

b) separating an individual sheet from the web;

c) attaching the individual sheet to an absorbent sliver;

d) forming the absorbent sliver into a tampon blank wherein the individual sheet substantially encloses the tampon blank;

e) compressing the tampon blank in a press to form a substantially cylindrical, compressed tampon having a cover comprising the individual sheet; and

f) applying an ejection force to the compressed tampon in an axial direction to eject the tampon from the press; and wherein a sufficient amount of the surfactant is applied to reduce the ejection force compared with the ejection force of a tampon, with a cover free of surfactant;

g) transferring said compressed tampon to a further press and

h) forming the introduction end into a dome-shaped configuration such that the cover being at least partially extended onto said dome-shaped introduction end wherein the tampon is capable of expending to a substantially cylindrical body without significant constrictions at the introduction end.

14. The process of claim 13 wherein the hydrophilic nonionic surfactant is applied at a coating weight of about 0.1 to about 0.4 gsm.

15. The process of claim 14 wherein the coating weight is about 0.16 to about 0.36 gsm.

16. The process of claim 13 wherein the fluid-impervious plastic material comprises a blend of at least two thermoplastic polymeric components, a continuous phase of a first thermoplastic polymeric component that exhibits a first melting point temperature and a dispersed phase of an immiscible, second thermoplastic polymeric component that exhibits a second melting point temperature, less than the first melting point temperature, such that when the web is heated to a temperature between the first

melting point temperature and the second melting point temperature, the second thermoplastic polymeric component is capable of forming an adhesive bond between said plastic material and the absorbent body and between said first and second surfaces of the web.

17. The process of claim 16 wherein the step of attaching the individual sheet comprises applying heat and pressure to thermally bond the sheet to the absorbent structure.

18. The process of claim 13 wherein the hydrophilic nonionic surfactant is an ethoxylate selected from the group comprising ethoxylated fatty acid polyolesters, polyoxyethylene alkyl ethers and ethers of olefinic diols.

19. The process of claim 13, wherein said hydrophilic nonionic surfactant is applied to the web as a processing aid.

20. Tampon comprising an absorbent body, having an introduction end and a withdrawal end, and a longitudinal main portion therebetween; the tampon comprising a cover comprising fluid impervious plastic material in the form of a resilient three-dimensional web having a multiplicity of perforations, said web comprises a nonionic surfactant covering at least partially an outer surface of the web to form a coated portion, said coated portion of said cover being at least partially extended onto said introduction end and having overlapping portions being folded upon each other in a substantially unbonded manner on said introduction end.

21. Tampon according to claim 20, wherein said surfactant is an ethoxylate.

22. Tampon according to claim 21, wherein said ethoxylate is an ethoxylated fatty acid polyolester.

23. Tampon according to claim 22, wherein said ethoxylate is an ethoxylated fatty acid sorbitan ester.

24. Tampon according to claim 23, wherein said ethoxylated fatty acid sorbitan ester is selected from the group comprising polyoxyethylene sorbitan laurate, polyoxyethylene sorbitan palmitate, polyoxyethylene sorbitan stearate, polyoxyethylene sorbitan tristearate, polyoxyethylene sorbitan oleate and polyoxyethylene sorbitan trioleate.

25. Tampon according to claim 26, wherein said polyoxyethylene sorbitan laurate is a polyoxyethylene-20-sorbitan monolaurate.

26. Tampon according to claim 21, wherein said ethoxylate is a polyoxyethylene alkyl ether.

27. Tampon according to claim 26, wherein said polyoxyethylene alkyl ether is selected from the group comprising polyoxyethylene lauryl ether, polyoxyethylene stearyl ether, polyoxyethylene cetyl ether and polyoxyethylene oleyl ether.

28. Tampon according to claim 27, wherein said polyoxyethylene stearyl ether is polyoxyethylene (10) stearyl ether.

29. Tampon according to claim 21, wherein said ethoxylate is an ether of polyethylene glycol.

30. Tampon according to claim 20, wherein said nonionic surfactant is applied at a coating weight of about 0.1 to about 0.4 gsm.

31. Tampon of claim 30, wherein said nonionic surfactant is applied at a coating weight of about 0.16 to about 0.36 gsm.

32. Tampon of claim 20, wherein said introduction end of the tampon being dome-shaped.

33. Tampon according to claim 20, wherein said web of fluid impervious plastic material comprises a blend of at least two thermoplastic polymeric components, a continuous phase of a first thermoplastic polymeric component that exhibits a first melting point temperature and a dispersed phase of an immiscible, second thermoplastic polymeric component that exhibits a second melting point temperature, less than the first melting point temperature, such that when the web is heated to a temperature between the first melting point temperature and the second melting point temperature, the second thermoplastic polymeric component is capable of forming an adhesive bond between said plastic material and the absorbent body and between said first and second surfaces of the web.

34. Tampon according to claim 20, wherein said cover having overlapping portions on the introduction end of the tampon, said overlapping portions being not bonded to the absorbent structure.

35. Tampon according to claim 20, wherein said web has first and second surfaces, the first surface exhibiting said multiplicity of apertures therein, each of the fiber-like elements exhibiting a cross-section comprising a base portion in the plane of the first surface and a sidewall portion joined to each edge of the base portion, the sidewall portions extending generally in the direction of the second surface of the web, the intersecting sidewall portions being interconnected to one another intermediate the first and second surfaces of the web, the interconnected sidewall portions terminating substantially concurrently with one another in the plane of the second surface.

FIG. 1

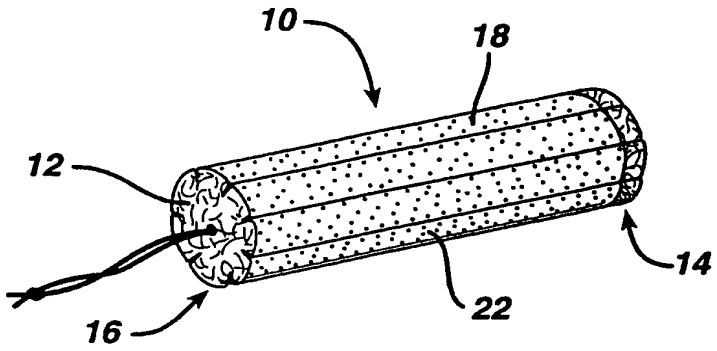


FIG. 2

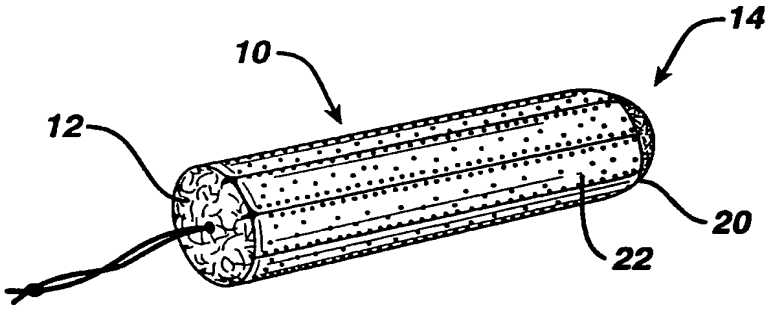
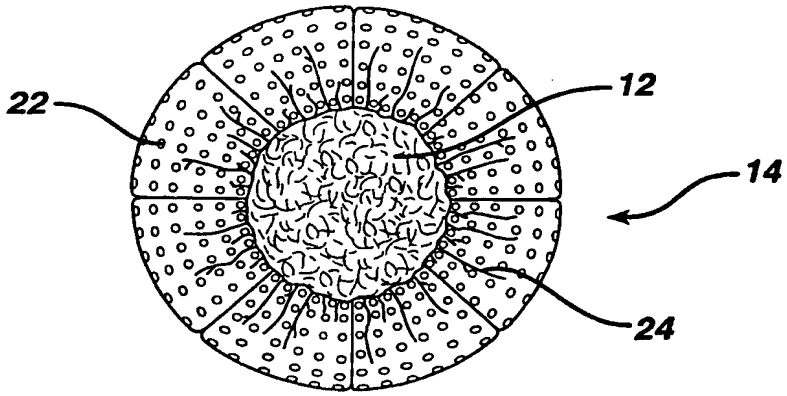


FIG. 3



INTERNATIONAL SEARCH REPORT

Inter. nal Application No
PCT/US 00/13812

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A61F13/20

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 A61F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
WPI Data, PAJ, EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 909 884 A (SCHWANKHART GERHARD) 8 June 1999 (1999-06-08) abstract; claims; figures	1-35
A	US 3 683 912 A (OLSON VIRGINIA A ET AL) 15 August 1972 (1972-08-15)	
A	US 5 693 037 A (LEE YANN-PER ET AL) 2 December 1997 (1997-12-02)	
A	US 4 435 172 A (GROSS JAMES R) 6 March 1984 (1984-03-06)	

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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31 August 2000	06/09/2000

Name and mailing address of the ISA	Authorized officer
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